CS – Scientific Knowledge

CM11 Basic Chemistry

C	30
TD	28
TP	12
THE	50

AUTUMN
SPRING

6 CREDITS

OBJECTIVES:

- Identify basic concepts in chemistry: atomic and molecular structures, ionic equilibrium, oxidation and kinetics.

SYLLABUS:

- Atomic structure and periodic table
- Solubility solutions and solution equilibrium
- Chemical bonds
- Acid–base reactions
- Oxidation reactions
- Chemical reaction kinetics

MT11 Basic Algebra

C	45
TD	56
THE	19

AUTUMN

6 CREDITS

Prerequisites :
Terminale S

OBJECTIVES:

- Harmonise skills acquired at secondary school level.
- Learn to use thorough reasoning.
- Fundamentals in algebra and algebra analysis.

SYLLABUS:

- Logic, sets, relations, maps, and group, ring and fields.
- Polynomials and rational fractions
- Real numbers and sequence
- Real variable functions: limits, continuity, derivatives, Taylor formulae, limited developments
- Typical functions
- Vector space

MT12 — Integration – Linear Algebra – Multi–Variable Functions

C	45
TD	42
THE	33

SPRING

6 CREDITS

Prerequisite : MT11

OBJECTIVES:
- Integration theory and techniques.
- Matrix calculus.
- Introduction to multi–variable functions.

SYLLABUS:
- Linear algebra
- Integration
- Improper integrals
- Differential equations
- Second–order linear differential equations

MT26 — Suites – Séries – Fonctions de variable complexe

Translation in progress

C	30
TD	28
TP	12
THE	50

AUTUMN

6 CREDITS

Prerequisites : MT11, MT12

OBJECTIVES:
- Apporter l'essentiel des outils mathématiques d'analyse utiles à l'ingénieur.

SYLLABUS:
- Suites et séries numériques
- Suites et séries de fonctions
- Séries trigonométriques et séries entières
- Développement de fonctions en séries entières et de Fourier
- Fonctions de variable complexe
- Fonctions holomorphes
- Transformation de Fourier
- Transformation de Laplace

PS11 — Point Particle Mechanics and Geometric Optics

C	30
TD	28
TP	12
THE	50

AUTUMN
SPRING

6 CREDITS

OBJECTIVES:
- Acquire basic skills in point particle mechanics (kinematics, dynamics and energy)
- Study simple equipment using laws of geometric optics

SYLLABUS:
- Point particle mechanics
- Kinematics
- Dynamics
- Energy
- Movement
- Geometric optics
- Introduction
- Centred optical systems
- Image basics
- Lenses
- Instruments

PS12 — Measurement: Physics and Electricity

C 30
TD 28
TP 18
THE 44

AUTUMN
SPRING

6 CREDITS

OBJECTIVES:
- Acquire skills in physical measurements and electrical circuits.

SYLLABUS:
- Measurements: dimensional analysis, units, errors, uncertainties, uncertainty propagation, use of experimental results.
- Electrical circuits: general laws, steady–state, transitory and sinusoidal circuit behaviour. Power electronics
- Electrical circuits
- Electrostatics

PS25 — Solid Mechanics

C 30
TD 28
TP 12
THE 50

AUTUMN

6 CREDITS

Prerequisite : PS11

OBJECTIVES:
- Acquire fundamental skills for the analysis of rigid systems under loading. These skills are necessary for studying deformation.

SYLLABUS:
- Kinematics
- Kinetic energy in single and multi–body systems
- Dynamics: fundamentals, general theories, kinetic energy theorem

PS27 — Thermodynamics

C 30
TD 28
TP 12
THE 50

SPRING

6 CREDITS

OBJECTIVES:
- Acquire basic theoretical and practical skills: heat engines and thermal transfers.

SYLLABUS:
- Revision of basic mathematical tools
- From mechanics to thermodynamics
- Study of a thermodynamic system: the perfect gas (PG)
- First Law of Thermodynamics
- Second Law of Thermodynamics
- Heat engines (first part)
- Changes of state
- Heat engines (second part)
- Heat transfers

SQ20	Probability and Statistics
C 30 TD 28 THE 62 SPRING 6 CREDITS  Prerequisite : MT12	**OBJECTIVES:** ▸ Familiarize students with probability analysis and statistical methods used in laboratories and quality departments. **SYLLABUS:** ▸ Probability (probability space, discreet random variables) ▸ Statistics (sampling laws, confidence intervals, means, variance, hypothesis testing)

TM – Techniques and Methods

LO10 Personal Computers

C 30
TD 28
TP 12
THE 50

AUTUMN

6 CREDITS

OBJECTIVES:
- Acquire basic skills in the use of IT tools to be used by engineers.
- Be competent in using, supplementing and modifying important IT tools.

SYLLABUS:
- Computer structure and IT networks
- Information on multimedia computers
- Transmitting information on an IT network
- Scientific use of a spreadsheet
- Advanced spreadsheet use, including macros and additional programmes (e.g. Visual Basic)
- HTML document editing and creation of a mini website

LO11 Algorithms and Programming: Level I

C 24
TD 28
TP 21
THE 47

SPRING

6 CREDITS

Prerequisite : LO10

OBJECTIVES:
- Familiarise students with algorithm programming
- An application is created using a programming language

SYLLABUS:
- Conditions
- Loops
- Table 1 dimensions
- Table 2 dimensions
- Character string manipulation
- Functions and procedures
- Structures
- Files

LO21 — Algorithms and Programming: Level II

C 30
TD 28
TP 12
THE 50

AUTUMN

6 CREDITS

Prerequisite : LO11

OBJECTIVES:
- Learn to assemble iterative and recurring algorithms
- Study data structure and its role in algorithm design: lists, binary trees and its integration into the C language.

SYLLABUS:
- Programming
- Composite types in C
- Modules and sub–programmes
- Pointers and linked lists
- Importance of data structure and lists in the creation of algorithms
- Recurring algorithms
- Data structure: binary trees
- Introduction to compiling

LO22 — Introduction to Linux and system–oriented C Programming

C 30
TD 21
TP 18
THE 51

SPRING

6 CREDITS

Prerequisite : LO11

OBJECTIVES:
- Introduce students to Linux operating system basics and study the system–oriented C language.

SYLLABUS:
- Introduction to Linux operating system
- File system
- Process basics
- Shell: the command language
- Recall basics of C programming language
- Dependency–tracking build utilities
- Memory programme organisation
- High–level I/O: Files and directories
- Standard libraries for process management

PM11 — Scientific Reasoning

C 15
TD 56
THE 49

AUTUMN

6 CREDITS

OBJECTIVES:
- Develop a scientific approach, give a hypothesis, select and formulate an approach for solving a problem
- Learn to make a scientific judgement on results
- Learn to represent a physical problem mathematically and solve it using the appropriate tools

SYLLABUS:
- Mechanics
- Electricity
- Waves
- Radioactivity
- Functions and derivatives
- Algebra / Vectors / Projections
- Trigonometry
- Differential equations
- Complex numbers

TN13 Introduction to Engineering Techniques

C	24
TP	48
THE	48

AUTUMN
SPRING

6 CREDITS

OBJECTIVES:

- Acquire basic skills in different techniques: technical drawing, mechanism analysis, automation.
- Use modelling tools: CAD – automation simulation tools.

SYLLABUS:

- Orthogonal projection and layout standards
- Hidden views, sections
- Mechanical linkages and kinematic schematics
- Bill of materials
- Part–sourcing procedures
- Functional dimensioning
- Introduction to CAD

Glossary of Online UV consultation

Prerequisite : Some UVs require that previous UVs must have been successfully completed. Some UVs have several prerequisites.
ACM : Actuators and Mechatronic Control Systems Specialisation.
C : Lecture
Category : Each UV is classed in one of the following categories:
- – CS Scientific Knowledge;
- – TM Techniques and Methods;
- – EC Expression and Communication;
- – CG General Education;
- – RN Revision;
- – EX Exterior.

CDP : Product Design and Development Specialisation
CIM : Design and Material Innovation Specialisation
UV Code : Code designating a UV
ECTS Credit : The value of a UV in the ECTS system (European Credit Transfer System)
CSM : Mechatronic System Design Specialisation
CSP : Production Systems Design Specialisation
Department : Teaching Department
Dept. Teaching Department
DIC : Industrial Design Specialisation
EDD : Energy and Sustainable Development Specialisation.
EDIM : Ergonomics, Design and Mechanical Engineering Department
EIC : Ergonomics, Design and Innovation Specialisation
EnE : Energy and Environment Specialisation.
ESE : Electronics and On–Board Systems Specialisation
Specialisation : Specialisation within a department
GESC : Electrical Engineering and Control Systems Department
UV Guide : The UV Guide catalogues all UVs taught at UTBM during an academic year.
HUMA : Humanities Department
IIRV : Image, Interaction and Virtual Reality Specialisation
ILC : Software and Knowledge Engineering Specialisation
IMAP : Manufacturing Management and Engineering Department
INFO : Computer Science Department
IP : Product Industrialisation Specialisation
Language (teaching) : Language in which a UV is taught in.
LEIM : On–Board Software and Mobile Computing Specialisation
MC : Mechanical Engineering and Design Department
MOM : Numerical Modelling in Mechanics.
MPL : Management of Production and Logistics Specialisation
Level : Level of UV within degree courses. From 01 to 06
Basket : Contains the UVs chosen by a user to create a personalised catalogue
PISP : Managing and Computerising Production Systems Specialisation
Recognition : Level of recognition within a specialisation or department (0, 1 or 2) for a UV :
- – 0: the UV has no link with the specialisation. It does not count as part of the department?s degree course, but rather as an additional UV.
- – 1 or *: the UV is related to the department?s degree course but is not part of the group of key skills to be acquired for the specialisation.
- – 2 or **: the UV is part of the group of key skills to be acquired for the specialisation.

R&T : Networks and Telecoms Specialisation
Semester : Indicates during which semester a UV is taught
Timetable Organisation : The way in which a UV is divided up into its constituent parts (TD, TP, Lecture, THE)
TC : Common core. Equivalent to first two years of an Engineering Degree
TD : Tutorials
THE : Unsupervised work. The number of hours of personal work necessary to complete a UV
TP : Practicals
TSE : Transport and Drive Systems Specialisation.
UV (Course Credit) : Course taught at UTBM. A Course Credit is taught within a department or department specialisation

Key

1. C : Lecture
2. TD : Tutorials
3. TP : Practicals
4. THE : Unsupervised work. The number of hours of personal work necessary to complete a UV.
5. Prerequisite : Some UVs require that previous UVs must have been successfully completed. Some UVs have several prerequisites.
6. EIC : Ergonomics, Design and Innovation Specialisation
7. DIC : Industrial Design Specialisation
8. ECTS Credit : The value of a UV in the ECTS system (European Credit Transfer System)
9. Language (teaching) : Language in which a UV is taught in.

CP92 — Design and Dimensioning of Complex Shapes

C (1)	TD (2)	TP (3)	THE (4)	Language (9)		ECTS (8)	DIC (7)	EIC (6)
32	28	18	42		SPRING	6 CREDITS	*DIC	*EIC

Prerequisite (5): CP80

OBJECTIVES:

- Gain awareness in the modelling of complex shapes.
- Students should be able to model objects and their associated interfaces using ergonomic and aesthetic criteria.

SYLLABUS:

- Impact of aesthetic, ergonomic, material and manufacturing constraints on product shape
- CAD surfaces in advanced software
- Mathematics applied to geometry (splines, Bézier curves, Nurbs')
- A-class complex surfaces